Unmanned Aircraft Systems Integration in the New York Terminal Area

Abstract

The New York City area is home to the busiest airspace in the world, with 4000 daily scheduled arrivals and departures of the five major surrounding airports (Newark Liberty International Airport, John F. Kennedy International Airport, LaGuardia Airport, Teterboro Airport, and Westchester County Airport). With an expected spike in commercial aviation, the airspace above New York will become increasingly congested and strenuous on the air traffic controllers. To ease traffic, the FAA is adopting NextGen, a new satellite based navigation system that increases operation, reduces delay and cost, and creates more efficient continuous landing approaches. The rise in unmanned aerial systems makes their integration into domestic airspace inevitable, particularly the surrounding New York airspace. By determining where UAS flight will cause the least interruption of current operations, the integration of UAS in the tri-state area may open new markets while still allowing the existing transportation network to operate safely and efficiently, uphold current aviation regulations, and utilize current and future airspace technologies, such as NextGen. By analyzing current traffic flow patterns around New York City, the design of more efficient routes and the possibility of future UAS integration become achievable objectives necessary for continued smooth operation of all aircraft.

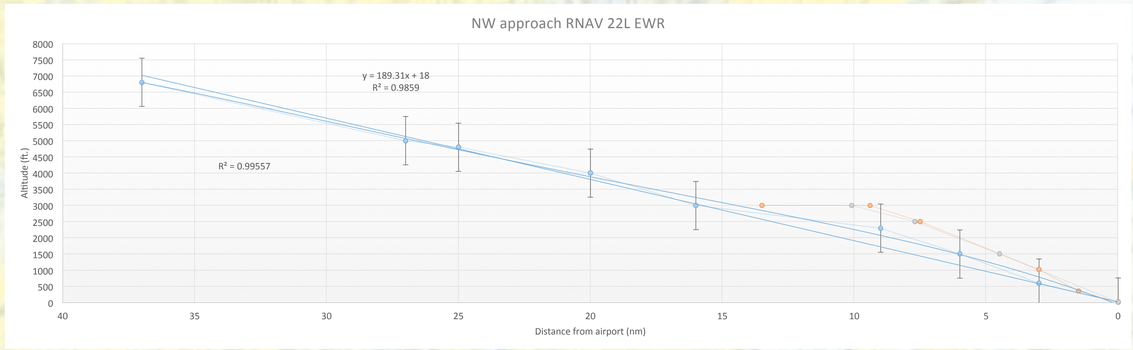
History of UAS

- Bombs attached to balloons (Pre-20th Century)
- Aerial Torpedoes (WWI)
- Radio controlled drones for anti-aircraft training (WWII)
- Radiation Data Collection (Manhattan Project)
- Large scale drone decoys (Cold War)
- Reconnaissance drones (Vietnam War)
- Full-sized combat drones (Operation Iraqi Freedom)
- Border patrol, Search and Rescue, Cartography, Wildfire Fighting (Current Domestic Uses)
- In 2012, the FAA and congress required plans for UAS integration created by 2015
- In 2013, the FAA selected six (6) UAS integration test sites to allow testing of necessary technology and procedures for UAS integration into NAS

FAA UAS Integration Test Sites (2013)

Current Airspace Analysis

- To understand air traffic patterns for arriving and departing commercial traffic in the New York City area, it was necessary to plot flight paths into and out of all major airports (EWR,JFK,LGA)
- The approach charts were plotted with position and altitude data from flightaware.com
- Verified by liveatc.net air traffic control communications.
- Validated by FAA flow prediction software at EWR

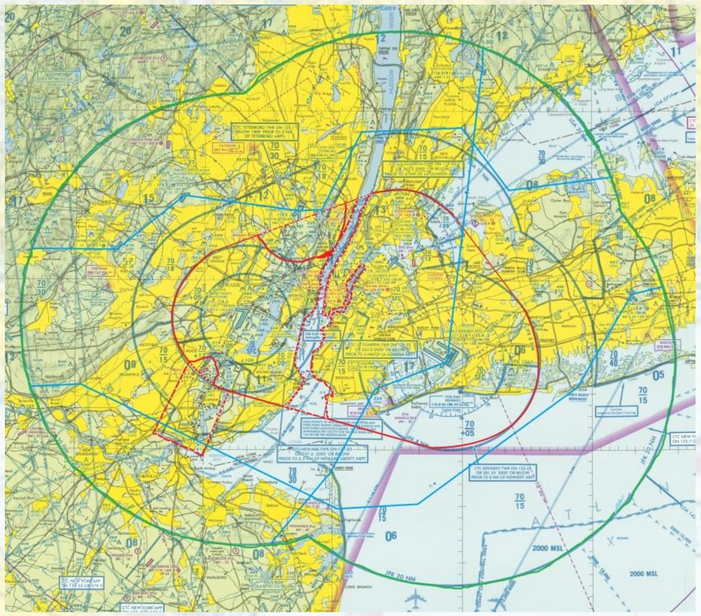


Newark Approach Data 22L

UAS Airspace Design

- Current and predicted air traffic (IFR & VFR) was included in potential UAS integration strategies
- Design 4 (shown below) was the most viable strategy by 4.25% in the Alternative Design Matrix.

- **Design 1**- UAS Flight Restricted Zone, Hudson and East River Exclusions
- **Design 2**- GPS navigation network (UAS only allowed on specific routes. Mostly point to point routes between airports.



- **Design 3**- All UAS flight prohibited in New York Terminal Area (control)
- **Design 4**-UAS Flight Restricted Zone, UAS transit routes (see UAS Airspace Proposal #4, left)

UAS Airspace Proposal #4

Alternative Design Matrix

		Design 1		Design 2		Design 3		Design 4	
Criteria	weight	rating	score	rating	score	rating	score	rating	score
IFR traffic Interference	15.00%	8	1.2	7	1.05	8	1.2	8	1.2
Residential Impact	7.50%	6	0.45	6	0.45	6	0.45	6	0.45
System Safety	17.50%	6	1.05	5	0.875	7	1.225	6	1.05
System Security	10.00%	8	0.8	7	0.7	7	0.7	7	0.7
VFR Traffic Alterations	7.50%	5	0.375	5	0.375	6	0.45	9	0.675
Continuity with Existing System	10.00%	7	0.7	8	0.8	7	0.7	7	0.7
UAS Airport Access	7.50%	9	0.675	9	0.675	3	0.225	9	0.675
Emergency Procedures	2.50%	7	0.175	6	0.15	5	0.125	6	0.15
ATC Controller Responsibility	12.50%	5	0.625	7	0.875	3	0.375	7	0.875
Airspace Changes Required	10.00%	6	0.6	6	0.6	6	0.6	6	0.6
Total	100%		6.65		6.55		6.05		7.075

Alternate Design Matrix

UAS Operational Procedures in New York Terminal Area

- Inside lateral limits of Class B airspace (green line): All UAS must be in contact with air traffic control, unless otherwise noted. (see below)
- UAS Transition Routes (blue lines): within 1.5 nm of the center line at an altitude between 3500 ft. and 5500 ft. MSL. Allows transition of UAS without controller contact when within these limits. Two E-W routes, One N-S route.
- UAS Flight Restricted Zone (Red lines): UAS operation in this zone requires a special flight plan and authorization from ATC.
- Linden and Teterboro exclusions: operations in the airspace of these two airports will permit UAS flight.
- Hudson and East River Exclusions: Flight over the river permitted below 500 ft. or higher with ATC authorization.
- EWR Approach Altitude Restriction: UAS in dashed rectangle SW of EWR are restricted to below 1200 ft. unless in transition route or ATC control.
- EWR, JFK, and LGA are prohibited for UAS operations

Conclusion

The integration of unmanned aircraft systems is possible in the New York Terminal Area with minimal changes to the current airspace structure or manned aircraft operations. In the near future, UAS integration will open the skies to new scientific and economic endeavors not possible with current manned aircraft.

Sponsors:
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